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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/932,236	08/16/2001	Haining Yang	MI22-1725	4828

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EXAMINER

HOGANS, DAVID L

ART UNIT PAPER NUMBER

2813

DATE MAILED: 11/04/2002

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/932,236

Applicant(s)

YANG, HAINING

Examiner

David L. Hogans

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 August 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-4, 6-10, 13, 14 and 42-47 is/are pending in the application.
- 4a) Of the above claim(s) 5, 11, 12 and 15-41 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4, 6-10, 13, 14 and 42-47 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 August 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 9.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

This office action is in response to Amendment B filed August 14, 2002.

Cancelled Claims

Examiner acknowledges the cancellation of Claims 5, 11, 12 and 15-23.

Claim Rejections - 35 USC § 112

Examiner withdraws the 35 USC 112 rejection concerning Claim 13 pursuant to Applicant's clarification.

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 3, 6-10 and 14 are rejected under 35 U.S.C. 102(b) as being anticipated by 5,130,172 to Hicks et al.

In reference to Claim 1, Hicks et al. teaches:

- a semiconductor substrate (See column 3 lines 23-34)
- a metallo-organic precursor proximate the substrate not comprising platinum and comprising one or more of rhodium, iridium, cobalt, palladium, and nickel (See columns 3-5 lines 60-05)

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- exposing the precursor to a reducing hydrogen atmosphere wherein the released metal consists essentially of rhodium, iridium, cobalt, palladium, and nickel (See column 3 lines 38-46 and columns 5-6 lines 55-02)
- depositing the released precursor over the semiconductor substrate (See column 3 lines 29-40)

In reference to Claim 3, Hicks et al. teaches:

- a silicon substrate that is oxidizable, the metal mass formed directly on the upper surface and wherein the upper surface is exposed to the reducing atmosphere during the release of the metal (See column 3 lines 29-40)

In reference to Claims 6-10, Hicks et al. teaches:

- a precursor comprised by rhodium, iridium, cobalt, palladium or nickel and wherein the released metal consists essentially of one of the before mentioned (See columns 3-5 lines 60-04 and columns 5-6 lines 55-02)

In reference to Claim 14, Hicks et al. teaches:

- a reducing atmosphere comprised by hydrogen (See column 3 lines 38-44)

3. Claims 2 and 4 are rejected under 35 U.S.C. 102(b) as being anticipated by 5,856,236 to Lai et al.

In reference to Claim 2, Lai et al. teaches:

- a semiconductor substrate (See column 3 lines 35-37)
- one or more metallo-organic precursors proximate the substrate wherein at least one does not comprise platinum (See columns 4-5 lines 55-20)
- exposing the precursor(s) to a reducing atmosphere (See column 4 lines 30-40)
- depositing the released metal over the substrate (See column 4 lines 10-15 and lines 30-40)
- the substrate comprises an upper surface consisting of TiN and TaN and is also exposed to the reducing atmosphere (See column 4 lines 1-15 and lines 30-40)

In reference to Claim 4, Lai et al. teaches:

- wherein the metal comprising mass is formed physically against the upper surface (See column 4 lines 10-15 and Figure 2)

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 13 rejected under 35 U.S.C. 103(a) as being unpatentable over 5,130,172 to Hicks et al. in view of 5,907,789 to Komatsu.

Incorporating all arguments of Claim 1 and noting that Hicks et al. failed to explicitly teach the deposition of rhodium, iridium, cobalt, palladium or nickel by a plasma activated hydrogen.

However, Komatsu, in columns 21-22 lines 64-29, teaches the deposition of rhodium, iridium, cobalt, palladium or nickel by a plasma activated hydrogen (i.e. – a microwave power of 2.0 kW). Furthermore, Komatsu teaches that this layer forms a low resistance plug or interconnect.

It would have been obvious to one of ordinary skill in the art to modify Hicks et al. in view of Komatsu's teachings of the deposition of rhodium, iridium, cobalt, palladium or nickel by a plasma activated hydrogen (i.e. – a microwave power of 2.0 kW). Hicks et al. modification via Komatsu's et al. teachings is obvious because the formed layer creates a low resistance contact or plug.

6. Claims 42-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over 5,856,236 to Lai et al.

Incorporating all arguments of Claim 2 and noting that Lai et al. fails to explicitly teach an upper surface comprised by titanium, tantalum, tungsten or tungsten nitride.

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However, Lai et al., in column 4 lines 4-15, teaches depositing a metallo-organic metal over a titanium nitride or a tantalum nitride. As titanium, tantalum and tungsten and their nitrides are well known barrier metal layers within the art, the use of titanium, tantalum, tungsten or tungsten nitride as an alternative barrier layer is deemed equivalent to the use of titanium nitride or tantalum nitride.

It would have been obvious to modify Lai et al. in view of generally known principles within the art that titanium, tantalum and tungsten and their nitrides are commonly used barrier metal layers. Therefore, titanium, tantalum, tungsten and tungsten nitride are deemed equivalents of titanium nitride or tantalum nitride.

Response to Arguments

7. Applicant's arguments with respect to claims 1-4, 6-10, 13-14 and 42-47 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to David L. Hogans whose telephone number is (703) 305-3361. The examiner can normally be reached on M-F (7:30-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on (703) 308-4940. The fax phone numbers for the organization where this application or proceeding is assigned are (703)

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308-7722 for regular communications and (703) 308-7724 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-1782.

dh


November 1, 2002


CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
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